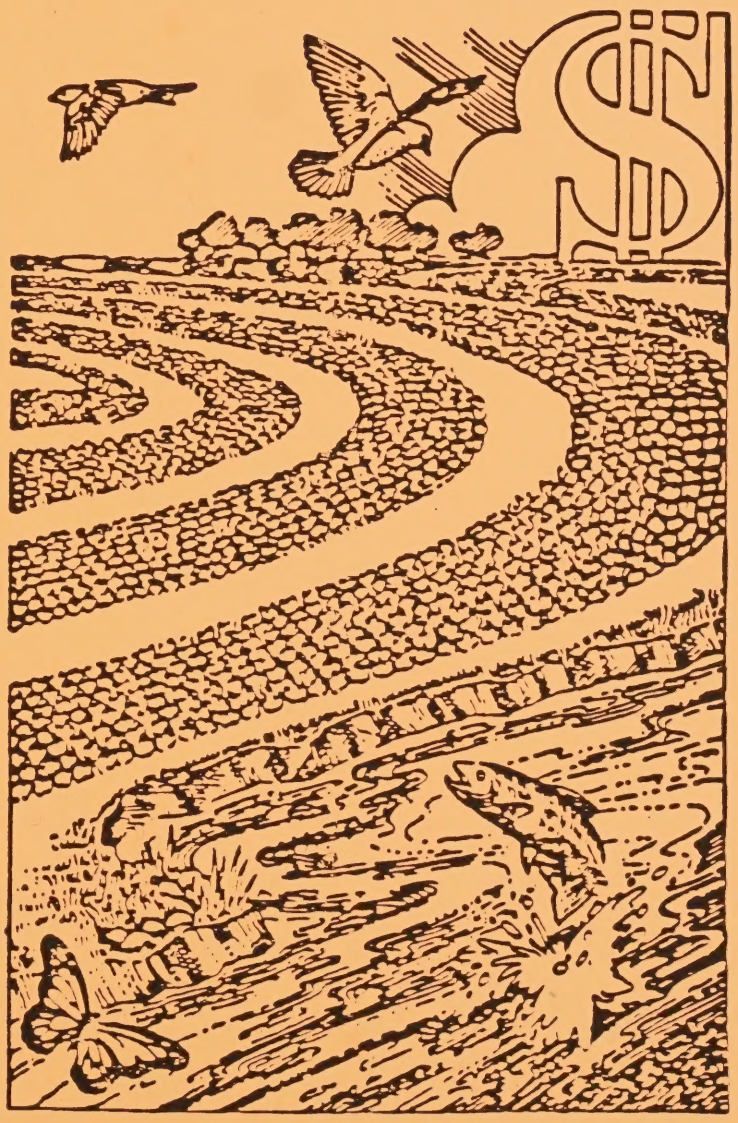
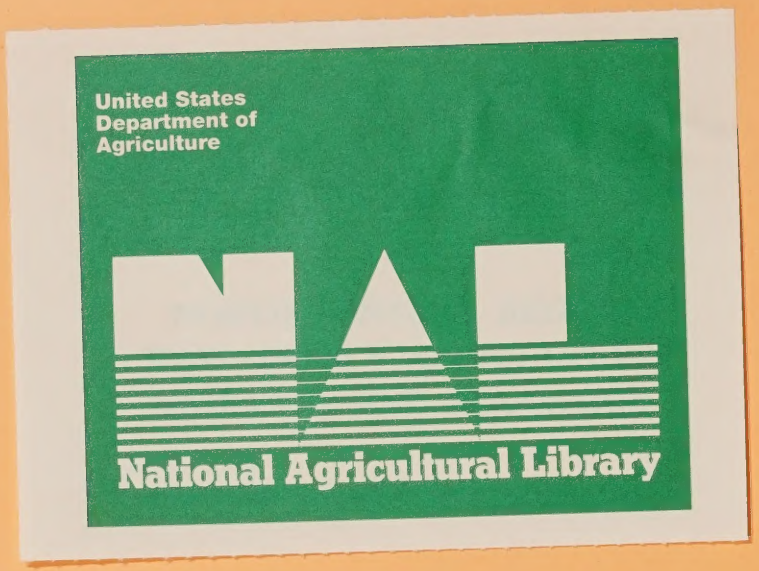
SOUTH DAKOTA

North-Central Region Projects Supported by the Sustainable Agriculture Research and Education Program





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OVERVIEW OF SOUTH DAKOTA PROJECTS

Congress has provided steady support for the Sustainable Agriculture Research and Education (SARE) grants program, formerly known as LISA, Low-Input Sustainable Agriculture. Administered by Cooperative State Research Service (CSRS), with the Cooperative Extension Service as a full partner, this program is forging partnerships between farmers, scientists, educators, agribusiness, non-profit organizations, and government -- a partnership that is promoting better stewardship of the Nation's natural resource base. The SARE/LISA program has supported 206 new projects since its inception in 1988. The ACE program (Agriculture in Concert with the Environment, funded by CSRS and EPA) has funded 53 projects starting in 1991.

Projects funded are typically carried out by teams of farmers, university research and education staff, government agencies, non-profit organizations, and private enterprise. Top priority is given to whole-farm integrated systems projects, usually including on-farm research and demonstrations. These projects are providing scientific documentation of low-input sustainable farming practices and systems, in comparison with conventional or chemical-intensive agriculture.

Farmer involvement is one of the strengths of this program. Farmers have been actively involved in the administration of the SARE/LISA program since its inception. Five producers from the North Central region have served on the regional Administrative Council which develops priorities and policies, and selects projects to fe funded. A North Dakota farmer, Fred Kirschenmann, now chairs the AC. Six producers have also served on the Technical Committee which evaluates and recommends project proposals for funding.

Nationwide, over 2,000 farmers have participated in projects during the first four years. When farmers participate in the planning and execution of a project, two important things happen. Concerns of farmers are foremost in the design of the project. And scientists get directly exposed to innovative ideas developed or tried by farmers. These ideas often become an integral part of scientific studies. The result is both better science and a more widespread adoption of sustainable farming methods that are economically viable, socially acceptable, and environmentally sound, thereby assuring cleaner water and a plentiful supply of safe food for generations to come.

Projects Funded 1988-1992

Three SARE projects and one ACE project that include South Dakota scientists, farmers, or educators in major roles are described here. They received a total of $416,100, and provided $445,336, matching funds. In two of the projects, a South Dakota scientist serves as the Project Coordinator. In the other two projects, a South Dakota scientist is contributing to a multi-state project headquartered in another state.

LOW-INPUT SUSTAINABLE AGRICULTURE DATA BASE AND INFORMATION SYSTEM (LNC88-7)

Project Coordinator: Tory Shade, **University of Missouri**

South Dakota Major Participant: Robert Hall, **South Dakota State University.**

States involved in Project: Missouri, New Jersey, Nebraska, Ohio, Minnesota, Michigan, Kansas, Iowa, South Dakota, North Dakota, Wisconsin and Illinois.

Major Participants: **University of Missouri:** John Ikerd; **Rutgers University in New Jersey:** Zane R. Helsel; **University of Nebraska:** Charles Francis; **Ohio State University:** Nancy Creamer; **Conservation Tillage Information Center:** John Becherer; **Minnesota TDI:** Kris Sanda; **Michigan State University:** Oran Hesterman; **Kansas State University:** John Hickman; **Practical Farmers of Iowa/ISU:** Rick Exner; **Iowa State University:** Dennis Keeney; **South Dakota State University:** Robert Hall.

Cooperators: **Kansas Rural Center:** David Ebbert; **North Dakota State University:** Steve Edwardson; **Land Stewardship Project:** Ron Kroese; **Wisconsin Rural Development Center:** Denny Caneff; **University of Illinois:** Richard Ford; **Iowa State University:** Jerry DeWitt; **University of Minnesota:** Joe Zuzenco.

Objectives:

(1) Representatives from the 12 North Central states will coordinate activity by conference call and a regional meeting. Each will submit a state plan for contribution and management of the data base system.

(2) The system will interface, where appropriate, with private organizations, the National Agricultural Library, ATTRA, and the other three regions.

Procedures and Findings

The ultimate goal of this project is to provide a framework for the development of a computer-based information system which can be accessed by farmers directly or indirectly through those who work with farmers, primarily extension agents. Information on research results; educational events; materials and aids; and farmer-to-farmer or

researcher experiences will be available for potential use by farmers and others to incorporate into American agriculture production and food systems.

A regional committee made up of 19 state and private organizations and farmer representatives conferred on various occasions by phone, meeting and by letter to develop general suggestions.

It was decided that the following types of information be considered for a computer information data base (presented in order of importance): (1) semi-technical and extension publications; (2) journal and similar articles (refereed); (3) field day-/meeting/annual project reports; (4) list of experts/expertise; (5) popular press articles (farm magazines, etc.); (6) farmer/researcher/service personnel "observations"; (7) message/question & answer board; (8) newsletter (include calendar of events, titles of new reports, etc.) to be printed on a cost-recovery basis; (9) calendar of events; (10) list of books, videotapes, suppliers, slide sets, computer programs.

The findings of this project have become part of the organizational structure of the Sustainable Agriculture Network, funded by national SARE program funds. Jill Auburn is chair of the committee developing and implementing the network, and Tory Shade is an active member of the committee.

Project Duration: One year, starting June 1, 1988.

Funding: LISA Funds: $5,000 in 1988; Matching Funds: $8,156.

AGRONOMIC AND ECONOMIC ANALYSES OF ALTERNATIVE SMALL GRAIN/ROW CROP PRODUCTION SYSTEMS FOR THE NORTHERN PLAINS (LNC88-9 and LNC92-43)

Project Coordinator: James D. Smolik, **South Dakota State University.**

Major Participants:

South Dakota State University: Thomas L. Dobbs, Agricultural Economics; Diane Rickerl, Agroecologist; Thomas E. Schumacher, Soil Biophysics; Howard J. Woodard, Soil Fertility; Leon J. Wrage, Extension Agronomist; George W. Buchenau, Plant Pathologist; James R. Gerwing, Extension soil Specialist.

Northern Plains Sustainable Agriculture Society: Terry Jacobsen, Wales, **ND**; Lyle Busch Bristol, **SD**.

USDA, Northern Grain Insect Research Lab: Walter E. Riedell, Brookings, **SD**.

State Involved in Project: South Dakota and North Dakota.

Objectives:

(1) Determine the long-term agronomic and economic performance of alternative (low-input/sustainable), conventional, and reduced-tillage farming systems.

(2) Compare machinery utilization and costs for alternative and conventional farms.

(3) Measure soil physical parameters, including soil strength, bulk density, moisture, pore size, and surface residues.

(4) Measure weed, nematode, earthworm and soil microbe populations.

(5) Increase opportunities for exchange of information regarding alternative farming systems among farmers, extension personnel, private organizations, and university researchers.

Results and Future Plans

This study will complete agronomic and economic analyses of alternative (low input/sustainable), conventional, and reduced-till farming systems, and will place a major emphasis on the longer-term, post-transition effects following adoption of alternative systems. The study is part of a long-term multidisciplinary investigation of farming systems initiated in 1984 by South Dakota State University. A primary impetus for this study was individual farmers and groups of farmers, and their active involvement in the research has continued. The overall objective of this effort is to compare the agronomic and economic sustainability of the various systems. The alternative systems are legume-based, and use primarily on-farm resources to meet crop nutrient needs and to control pests. The conventional and reduced-till systems receive recommended inputs of fertilizer and pesticides. This study includes both on-farm and experiment station components. The study began as an on-farm study in 1984 and, in part because of questions arising from both farmers and researchers, was enlarged in 1985 to include experiment station trials. SARE (LISA) funding was first received in 1988; in 1993 the project will be completed, with the last year of funding provided by the ACE program.

The on-farm study in east-central South Dakota compares an alternative system (a four-year rotation of small grain/alfalfa-alfalfa-soybean-corn, with no inputs of commercial fertilizer or pesticide), to a reduced-till corn-soybean rotation that receives conventional inputs of fertilizer and pesticides. The experiment station component includes two studies at SDSU's Northeast Research Station. Study 1 emphasizes row crops, while Study 2 emphasizes small grains. Study 1 compares an alternative system with conventional and ridge-till systems. The alternative system experiment is modeled very closely after the alternative system in the on-farm component. The experiment station setting has allowed us to increase the number of replications to four, and has afforded greater control of cultural practices such as tillage, timing of planting and other operations, and varieties planted. The overall effect has been to increase the scientific validity of both the on-farm and experiment station components, and to substantially increase farmer involvement in this research. In addition, because the climate at the experiment station location (northeastern South Dakota) is markedly different from that of the on-farm study, we are able to test the climatic adaptability of alternative systems. The second experiment station study (Study 2) also includes three systems; it compares a different alternative system to conventional and minimum-till systems. The legume crop in this alternative system is clover, and it is handled as a green manure crop.

Harvested crops included in these studies are corn, soybeans, oats, barley, spring wheat and alfalfa, which represent the dominant crops grown in much of the Northern Plains. The alternative systems in both experiment station studies are 4-year rotations, while the conventional and reduced-till systems are three-year rotations. At the conclusion of the experiment station studies we will have completed at least two cycles of all rotations which, in combination with the on-farm component, will allow us to project with more precision the relative agronomic and economic sustainability of the various systems.

Agronomic data on yields and cultural practices from both the on-farm and the experiment station study components are incorporated in whole-farm economic models by agricultural economists on the research team. The operations of the alternative and conventional case farms in east-central South Dakota have been modeled to show costs and various measures of net return, on whole-farm basis, each year since 1985. Likewise, the farming systems at the Northeast Research Station have been "simulated" in whole-farm models, assuming 540 available crop acres on each farm and participation in the federal farm program for food and feed grains. Since there are two studies at the Northeast Station, each containing comparisons of three farming systems, a total of six whole-farm economic models are analyzed each year for the experiment station component of this project. For both the on-farm and experiment station, economic modeling representative input and output prices (each year) for eastern South Dakota, together with applicable farm program deficiency payments and set-aside requirements, are used in estimating whole-farm costs and returns. When this project is completed, eight years of agronomic and economic data will have been compiled and analyzed for two "operational" and six "simulated" whole farms. The analyses will have covered five

"transition" years (1985-1989) and three "post-transition" years (1989-1992). Meanwhile, the financial results of the first seven years of the study are as follows.

The sustainable system in Study 1 at SDSU's northeast research station has been more profitable, on average, over the past 7 years than either the conventional or the reduced-tillage system. In Study 2 at the northeast station, the conventional system has been just slightly ($1/acre) more profitable than the sustainable system. The sustainable system in study 2 is not high in labor use, because an unharvested green manure legume (a sweet clover-red clover mix) is used, rather than a harvested forage legume. The reduced-tillage systems (both of which involve use of chemical fertilizers and herbicides) were least profitable.

Profitability measures in the longitudinal on-farm study of two east-central South Dakota farms show the conventional farm to have been more profitable than the sustainable farm, on average, over the 1985-1991 time period. Direct costs were much lower on the sustainable farm, but not low enough to offset the higher gross income on the conventional farm. Also, labor (including operator and family labor) costs were higher on the sustainable farm, causing the net income difference between the two farms to widen when labor costs were subtracted (a $21 to $24 per acre difference, depending on the profit measure used).

Personnel involved in this project are: James Smolik, plant scientist/nematologist, project leader of the Alternative Farming Systems project and manager of the Northeast Research Station. He will continue to serve as overall coordinator of this LISA project; Thomas Dobbs; agricultural economist, who will continue to direct the economic components; Diane Rickerl, agroecologist, who will measure phosphorus and water relationships, and microbe ecology; Thomas Schumacher, soil physicist, who will study selected soil physical properties and the effect of farming systems on soil tilth; Howard Woodard, soil nutritionist, who will investigate nutrient cycling and organic matter content and will provide fertilizer recommendations; Leon Wrage, extension agronomist/weeds, who will provide recommendations and evaluations of weed control practices.

The farmers involved in this research are Chris Johnke, conventional system farmer, and Charles and Allan Johnson, alternative system farmers. These farmers provide land for the replicated on-farm studies and also provide information on yields, inputs, labor, machinery, tillage practices, costs,k and marketing practices. They also aid in the evaluation of results from the experiment station studies.

Other cooperators in this study are George Buchenau, plant pathologist, SDSU, James Gerwing, extension soils specialist, SDSU, Terry Jacobsen, President of NPSAS, Lyle Busch, SD representative of NPSAS, and Walter Riedell, USDA, Northern Grain Insect Research Lab.

The economic comparisons, together with farm policy sensitivity analyses and with the agronomic components of the study, will provide valuable information for the Northern Plains on priority issues. Farmers, researchers, extension educators, and policy makers will have a much better understanding of the potential long-term agronomic, economic, and environmental sustainability of different farming systems in the Northern Plains' agroclimatic region where corn-soybean row crops and small grains (predominantly wheat) overlap. Some of the results will provide a basis for focusing and designing the next phase of sustainable agriculture research in the Northern Plains.

Project Duration: Five years, June, 1988 through August 31, 1993.

Funding: LISA Funds: $241,800; Matching Non-Federal Funds: $303,880.

LISA IMPACTS: SOCIAL, ECONOMIC, AND DEMOGRAPHIC IMPACTS OF LOW-INPUT SUSTAINABLE AGRICULTURE PRACTICES ON FARMS AND RURAL COMMUNITIES IN THE NORTHWEST AREA (LNC89-23)

Project Coordinator: David L. Watt, **North Dakota State University**

South Dakota Participant: S. Wika, **South Dakota State University**

Other Major Participant: North Dakota State University: G. A. Goreham

Farmer: T. Jacobson, **North Dakota**

States Involved in Project: North Dakota and South Dakota.

Objectives:

(1) Compare selected characteristics of operators who have adopted low-input sustainable agriculture (LISA) practices with those of their neighbors who are not involved in LISA practices;

(2) Analyze factors that affect the economic viability of LISA practices on farm/ranch operations;

(3) Determine the impact of the adopters of LISA practices on the community through purchasing and expenditure patterns and voluntary social involvements; and

(4) Determine the impact of various degrees of adoption of LISA practices at the multi-county and state level. Impacts to be addressed include taxes and changes to businesses and employment.

Results

The impacts of low-input sustainable agriculture (LISA) on farm economics, farm families, farming communities, regional centers, and state revenues is addressed in this research project. Paired comparisons were made between LISA and non-LISA farming operations in North Dakota. During the summer of 1989, questionnaires were designed and pretested. LISA farmers were paired with non-LISA farmers to provide research controls and to allow for comparisons of the two groups. A total of 35 operators involved in various NDSU Agricultural Experiment Station LISA production projects were surveyed. For each of these respondents, conventional operators in the same area, and with operations similar to those of the LISA farmers were surveyed. Thus, a total of 70 farmers participated in the study.

The survey consisted of a telephone questionnaire with a mail-out/mail-back follow-up. Items on the survey pertained to the respondents' farming practices, values and attitudes, farm finances, farm operation characteristics, community involvements, off-farm employment, and personal and family background. Based on the data collected from the two groups of farmers, models will be developed to determine the impact of LISA farming on local communities and on regional areas as it compares with non-LISA farming. Farmer involvement is critical for the design of the questionnaire, interpretation of the results and enhancing the acceptance of the findings by other farmers.

LISA operators were found to be younger than were their conventional counterparts (42.7 years and 50.3 years, respectively). LISA operators' spouses were younger than were their conventional counterparts (39.8 years and 45.9 years, respectively). The average household size of LISA operators was larger than that of conventional farmers (4.4 members and 3.4 members, respectively). No differences were found in the number of years the farms were in their families.

A greater proportion of LISA operators engaged in off-farm employment (55.9%) compared to the conventional operators (17.6%). However, of the farmers who engaged in off-farm employment, no differences were found in the number of days the two groups worked off the farm. No differences were found between the two groups in the proportion of spouses who held off-farm employment, nor in the number of hours they worked off the farm.

No statistically significant differences were found in the number of acres owned by LISA and conventional farmers, nor in the number of acres they rented to others. Conventional farmers rented more acres from others (1281.8 acres) than did LISA farmers (510.3 acres). No differences were found between the two groups in the number of acres

in the conservation reserve program (CRP), in pasture, hayland, rangeland or in woodland.

Conventional farmers used conventional farming practices on a larger percentage of their cropland (97.2%) than did LISA farmers (63.1%). LISA farmers used organic practices on a larger percentage of their cropland (29.2%) than did conventional farmers (5.8%). No differences were found between the two groups in the use of no-till practices.

The farmers were asked how many acres of various types of crops they raised. Differences were found only in two types. LISA farmers raised more acres of buckwheat (15.7 acres) than did their conventional counterparts (0.0 acres) but conventional farmers raised more acres of barley (104.3 acres) than did LISA farmers (48.8 acres). No differences were found in the percent of feed or seed the two groups purchased that had been grown in their respective counties. LISA farmers sold a greater proportion of their crops through organic markets (54.5%) than did the conventional farmers (0.0%).

The farmers were asked how many years they used various farming practices. Conventional farmers had used conventional practices for an average of 23.8 years compared with 13.7 years for LISA farmers. No statistically significant differences were found in the number of years the two groups used no-till practices or organic practices. No statistically significant differences were found between the two groups in the number of acres they had in rotation with summer fallow, in the number of years they did soil sampling, or in the number of years they scouted for weeds and/or insects. No statistically significant differences were found in the percentage of cropland where the two groups applied insecticide, fungicide, or herbicide. However, conventional farmers applied commercial fertilizer to an average of 63.1% of their cropland compared with LISA farmers who applied commercial fertilizer to an average of 37.9% of their cropland. LISA farmers used green manure for fertilizer on an average of 5.6% of their cropland and conventional farmers used green manure for fertilizer on an average of only 0.9% of their cropland. No differences were found between the two groups' use of animal manure.

No statistically significant differences were found between the two groups in the value of their farm assets or in the value of their farm liabilities. However, differences between the two groups were found in both their gross farm incomes and net farm incomes. Conventional farmers grossed an average of $104,057 in 1989 compared with $63,317 for LISA farmers. Conventional farmers netted an average of $21,530 in 1989 compared with $6,032 for LISA farmers.

Although no statistically significant differences were found between the two groups, one-third of LISA farmers (36.4%) and conventional farmers (32.4%) believed that the current programs kept them from planting a desired crop rotation. Whereas 18.2% of the LISA farmers and 29.4% of the conventional farmers believed current farm programs damaged their conservation efforts, the difference was not statistically significant.

However, when asked if current farm programs promoted conservation efforts, 57.6% of the LISA farmers and 23.5% of the conventional farmers agreed that they did.

Additional analysis will be conducted comparing the two groups of farmers and their financial viability (Objectives 1 and 2). Once that has been completed, we will address the impact of LISA on the community, sub-state region, and state (Objectives 3 and 4).

Project Duration: 2 Years, starting in 1989.

Total Funding: LISA Funds: $65,300; Matching Funds: $65,300

IMPACTS OF AGRICULTURAL MANAGEMENT SYSTEMS ON ECONOMIC, ENVIRONMENTAL, AND WILDLIFE VALUES OF ALTERED AND UNALTERED WETLAND AREAS (ANC92-11)

Project Coordinator: Diane H. Rickerl, Plant Science, **South Dakota State University.**

State Involved in Project: South Dakota.

Objectives:

1. To research the impact of farm production systems on avian populations, food supplies and habitat diversity of altered and unaltered wetland and upland tracts.

2. To determine the effects of farm production systems on the water balance of altered and unaltered sites, between wetland and upland agricultural tracts.

3. To determine the effects of farm production systems on the water quality of wetlands and ground water.

4. To estimate production costs and net returns of major farm production systems adapted to the selected field tracts.

5. To compare selected economic and environmental trade-offs between major farm production systems.

6. To develop holistic packages of information and an improved network for exchange of information concerning the effects of management on wetland values.

Funding: $104,000 for 2 years, starting September 1, 1992.
Matching Non-Federal Funds: $68,000.

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